PATENT SPECIFICATION

343,225

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PROVISIONAL SPECIFICATION.

Improvements in and relating to Speed Gears of the Infinitely Variable Type.

I, HERBERT REED HALL, of Fair View, Eldwick, Bingley, Yorkshire, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to speed gears of the so called infinitely variable type, such as is exemplified by an oppositely disposed pair of cone pulley elements having axially adjustable driving or transmission means between the two.

The object of the present invention is to provide an improved construction of gear of the above character, wherein the transmission or drive connection between the cone elements is of a more positive character and less liable to slip than, for example, the usual or known belt form, while the adjustment for producing the various ratios can be effected with facility.

According to the invention, the cone elements are provided with a drive transmission means embodying a rotary wheel or roller disposed between the adjacent conical surfaces and an annular rotary member embracing the conical elements and located in the same plane as the idler roller and displaceable therewith longitudinally of the conical elements for varying the gear ratio.

The contact pressure necessary for the efficient transmission of power from one to the other of the conical elements, is preferably effected by the aid of resilient means such for example as by the provision of a spring located at the base of each cone and adapted to resist axial displacement of the cone in a direction towards its base.

The transmission of power between the cones may take place through the roller or through the annulus or both may take a share of the work.

The roller and the annulus mutually assist in taking load or lateral pressure off the bearings.

In carrying out the invention according to one convenient mode by way of example, a pair of opposite disposed conical elements are mounted, one upon a driven shaft and the other upon a driving shaft, by the aid of splines or keys, such that the cones rotate with the shafts, but are capable of a predetermined axial displacement thereon. The limit of axial displacement may be determined by a thrust collar secured to each shaft at the apex end of the conical elements.

The base of each cone has applied thereto a compression spring tending to thrust the cones against their collars. According to one suitable form, the springs are located in cavities in the base of the cones and each has an abutment in the form of a collar formed upon or secured to the shaft.

The roller member referred to above is provided with a contact periphery or tread of curved or arcuate form, such that it may readily adapt itself to the conical surfaces. The roller is mounted upon a spindle, the axis of which is preferably parallel with that of the cones. The roller spindle is carried in bearings which are preferably floating in a frame hereinafter referred to.

The annulus or ring rotary member has a similar arcuate internal contact surface to that provided upon the roller.

A vertical framework or one transverse to the cone axes is provided for maintaining the position of the roller and annulus and effecting the longitudinal movement thereof for varying the gear ratio. The frame is slidably mounted upon a bed and the bearings for the roller may be carried from a slide way upon the frame, permitting the roller to travel in a path parallel to the cone surfaces.

The annular element is guided by auxiliary rollers carried by the frame which also serve as a means of applying displacements to adjust the position of the annular element concurrently with the roller.

The frame may be moved longitudinally of the cone members by geared screw thread or other means, such as are adapted to applying the necessary pressure for establishing an efficient driving contact.

Means may be provided, if desired, for altering the compression of the springs independently of the displacement of the roller and annulus.

Dated this 4th day of December, 1929.

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COMPLETE SPECIFICATION.

Improvements in and relating to Speed Gears of the Infinitely Variable Type.

I, HERBERT REED HALL, of Fair View, Eldwick, Bingley, Yorkshire, a British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to speed gears of the type comprising an oppositely disposed pair of cone pulleys having axially adjustable driving or transmission means between them.

The object of the present invention is to provide an improved construction of gear of the above character, wherein the transmission or drive connection between the driving and driven cone elements is better adapted to transmit loads or is of a more positive character and less liable to slip than, for example, the usual or known belt transmission agent, while the adjustment for producing the various ratios can be effected with facility.

The invention comprises the combination of a rigid annular rotary member embracing the conical pulleys and resilient means acting to give endwise movement to the cones for exerting pressure between the annular rotary member, the cones and the adjustable driving or transmission means between the cones.

The invention further comprises the arrangement of a frame which supports the adjustable driving or transmission means and which is traversable for longitudinally displacing both the said means and the annular rotary member relatively to the conical pulleys.

The contact pressure necessary for the efficient transmission of power from one to the other of the conical elements, is preferably effected by the provision of a spring located at the base of each cone and adapted to resist axial displacement of the cone in a direction towards its base.

The transmission of power between the cones may take place through the roller or through the annulus or both may take a share of the work, and the annulus serves to relieve the bearing of the elements from lateral pressure.

The roller and the annulus mutually assist in taking load or lateral pressure off the bearings.

In the accompanying drawings:—

Figure 1 is a diagrammatic end elevation partly in section illustrating one convenient mode of carrying the invention into effect, and

Figure 2 is a sectional plan view taken on the line 2—2 of Figure 1.

In carrying out the invention, a pair of opposite disposed conical elements a and b are mounted, one upon a driven shaft and the other upon a driving shaft, by the aid of splines or keys, such that the cones rotate with the shafts, but are capable of a predetermined axial displacement thereon. The limit of axial displacement may be determined by a thrust collar a^1 and b^1 secured to each shaft at the apex end of the conical elements.

The base of each cone has applied thereto a compression spring c tending to thrust the cones against their collars. According to one suitable form, the springs are located in cavities in the base of the cones and each has an abutment in the form of a collar formed upon or secured to the shaft, a ball thrust device d being preferably interposed between the collar and the supporting bearing e in any convenient form of frame or wall f.

Means may be provided, if desired, for adjusting the compression of the springs independently of the displacement of the roller and annulus.

A roller member g (referred to above) is provided with a contact periphery or tread of curved or arcuate form, such that it may readily adapt itself to the conical surfaces. The roller is mounted upon a spindle g^1, the axis of which is parallel with that of the cones. The roller spindle is carried in a bearing crosspiece g^2 which is floating or laterally slidable in a frame k referred to hereinafter.

The axis of the spindle g^1 may lie in the plane of the axis of the cones but it is preferred to position it slightly below or above such plane according to the direction of rotation, for example as seen in Figure 1 of the drawing in order to counteract any pressure on the axles due to turning.

An annulus or ring rotary member j is located in the plane of the roller g and has a similar arcuate internal contact surface to that provided upon the roller.

A vertical framework k or one transverse to the cone axes is provided for

maintaining the position of the roller and annulus and effecting the longitudinal movement thereof for varying the gear ratio. The frame is slidably mounted upon beds l carried by a casing or other fixture m. The frame k is provided with slideways k^1 for the crosspiece g^2, permitting the roller g to travel in a path parallel to the cone surfaces.

The annular element is located and guided by auxiliary rollers n at opposite sides thereof and carried by the frame k. These rollers also serve as a means of applying displacements to the annulus j to adjust its position concurrently with the roller.

For the purpose of altering the gear ratio the idler roller g and the annulus j are moved from the mid-position (see in Figure 2) towards one end or other of the driving cone according to the demand for an increased or decreased gear ratio. This displacement is effected through the frame k which is provided with a pair of screw threaded spindles o having nuts o^1 engaged by lugs k^2 through which the spindles pass. The shafts o are geared together and actuated by a common hand-wheel p.

It will be apparent that as an alternative to the arrangement above described the idler roller might be mounted upon a fixed axis parallel with the adjacent conical surfaces and displaceable in the direction of said axis while the annulus might be floated and adapted to accommodate itself laterally as change of gear ratio movements were affected.

I am aware that it has heretofore been proposed in friction gearing to arrange between two oppositely disposed cones, a wheel held in frictional contact by an elastic strap passing around the cones, the wheel being carried by a frame between the cones, which is traversed to move the wheel and the strap longitudinally of the cones.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In an infinitely variable speed gear of the type described, the combination of a rigid annular rotary member embracing the conical pulleys, and resilient means acting to give endwise movement to the cones for exerting pressure between the annular rotary member, the cones and the adjustable driving or transmission means between the cones.

2. In an infinitely variable speed gear of the type described and as claimed in claim 1, the arrangement of a frame which supports the adjustable driving or transmission means and which is traversible for longitudinally displacing both the said means and the annular rotary member relatively to the conical pulleys.

3. A gear as claimed in Claim 2 wherein the frame has auxiliary rollers on opposite sides of the annular member for locating and guiding the latter.

4. A gear as claimed in claim 2 or claim 3, wherein the frame has slideways for a crosspiece supporting the intermediate wheel or roller.

5. A gear having the features claimed in any of the preceding claims wherein the axis of the intermediate wheel or roller is mounted out of the plane of the axes of the driving and driven elements.

6. The improved variable gear substantially as described with reference to the accompanying drawings.

Dated this 2nd day of September, 1930.
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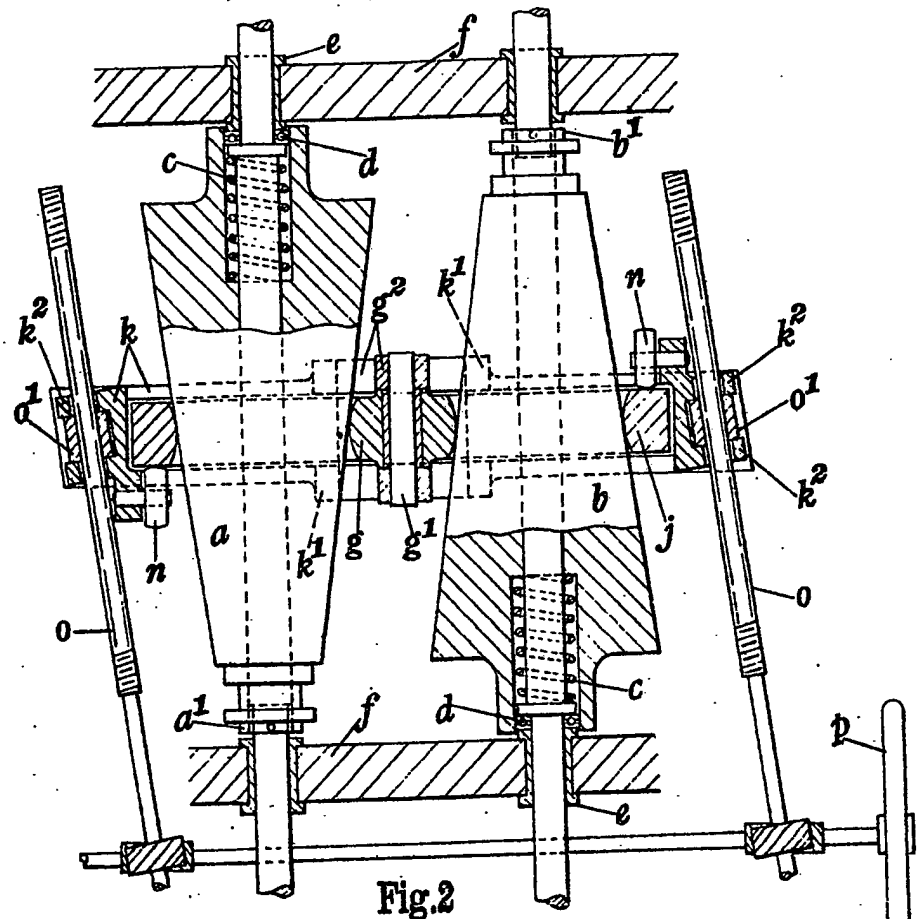

Fig.2

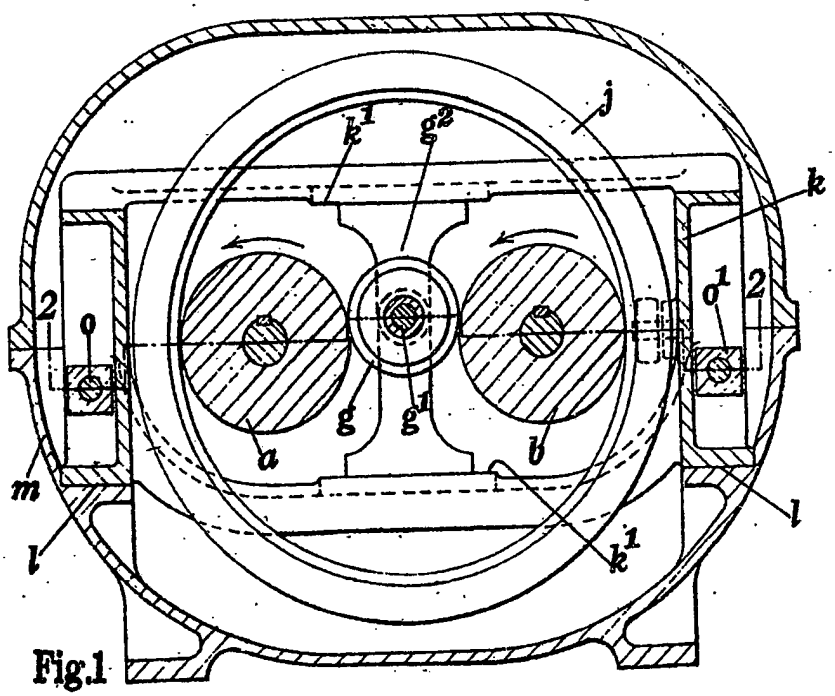

Fig.1

Charles & Read Ltd. Photo Litho.